

WHAT IS CLAIMED IS:

1. A method of manufacturing a semiconductor device comprising the steps of:
forming a semiconductor film on an insulating surface;
crystallizing the semiconductor film by irradiation of harmonic of a YVO₄ laser;
patterning the crystallized semiconductor film to form a crystallized island-like semiconductor film; and
forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film.
2. A method of manufacturing a semiconductor device according to claim 1, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.
3. A method of manufacturing a semiconductor device according to claim 1, wherein the harmonic is one of second harmonic, third harmonic, and fourth harmonic.
4. A method of manufacturing a semiconductor device comprising the steps of:
forming a semiconductor film on an insulating surface;
crystallizing the semiconductor film by irradiation of a continuous wave YVO₄ laser;
patterning the crystallized semiconductor film to form a crystallized island-like semiconductor film; and
forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film.
5. A method of manufacturing a semiconductor device according to claim 4, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.
6. A method of manufacturing a semiconductor device according to claim 4, wherein one of second harmonic, third harmonic, and fourth harmonic of the continuous wave YVO₄ laser is irradiated to crystallize the semiconductor film.

7. A method of manufacturing a semiconductor device comprising the steps of:
forming a semiconductor film on an insulating surface;
crystallizing the semiconductor film by irradiation of linear laser light of a YVO₄ laser;
patterning the crystallized semiconductor film to form a crystallized island-like semiconductor film; and
forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film.

8. A method of manufacturing a semiconductor device according to claim 7, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.

9. A method of manufacturing a semiconductor device according to claim 7, wherein the linear laser light is one of second harmonic, third harmonic, and fourth harmonic of the YVO₄ laser.

10. A method of manufacturing a semiconductor device comprising the steps of:
forming a semiconductor film on an insulating surface;
crystallizing the semiconductor film by irradiation of harmonic of a continuous wave YVO₄ laser;
patterning the crystallized semiconductor film to form a crystallized island-like semiconductor film; and
forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film.

11. A method of manufacturing a semiconductor device according to claim 10, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.

12. A method of manufacturing a semiconductor device according to claim 10, wherein the harmonic is one of second harmonic, third harmonic, and fourth harmonic.

13. A method of manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film on an insulating surface;
patterning the semiconductor film to form an island-like semiconductor film;
crystallizing the island-like semiconductor film by irradiation of harmonic of a YVO₄ laser;
and
forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film.

14. A method of manufacturing a semiconductor device according to claim 13, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.

15. A method of manufacturing a semiconductor device according to claim 13, wherein the harmonic is one of second harmonic, third harmonic, and fourth harmonic.

16. A method of manufacturing a semiconductor device comprising the steps of:
forming a semiconductor film on an insulating surface;
patterning the semiconductor film to form an island-like semiconductor film;
crystallizing the island-like semiconductor film by irradiation of a continuous wave YVO₄ laser; and
forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film.

17. A method of manufacturing a semiconductor device according to claim 16, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.

18. A method of manufacturing a semiconductor device according to claim 16, wherein one of second harmonic, third harmonic, and fourth harmonic the continuous wave YVO₄ laser is irradiated to crystallize the island-like semiconductor film.

19. A method of manufacturing a semiconductor device comprising the steps of:
forming a semiconductor film on an insulating surface;
patterning the semiconductor film to form an island-like semiconductor film;

crystallizing the island-like semiconductor film by irradiation of linear laser light of a YVO₄ laser; and

forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film.

20. A method of manufacturing a semiconductor device according to claim 19, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.

21. A method of manufacturing a semiconductor device according to claim 19, wherein the linear laser light is one of second harmonic, third harmonic, and fourth harmonic of the YVO₄ laser.

22. A method of manufacturing a semiconductor device comprising the steps of:
forming a semiconductor film on an insulating surface;
patterning the semiconductor film to form an island-like semiconductor film;
crystallizing the island-like semiconductor film by irradiation of harmonic of a continuous wave YVO₄ laser; and
forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film.

23. A method of manufacturing a semiconductor device according to claim 22, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.

24. A method of manufacturing a semiconductor device according to claim 22, wherein the harmonic is one of second harmonic, third harmonic, and fourth harmonic.

PROPOSED NEW CLAIMS

Please add following claims 25-45.

- 25. A method for manufacturing a semiconductor device comprising the steps of:
forming a semiconductor film on an insulating surface;
crystallizing the semiconductor film by irradiation of harmonic of a YVO₄ laser;
patterning the crystallized semiconductor film to form a crystallized island-like semiconductor film; and
forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film,
wherein the harmonic of the YVO₄ laser has a shape at an irradiation surface which has aspect ratio of 10 or more.
26. A method according to claims 25, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.
27. A method according to claim 25, wherein the harmonic is one of second harmonic, third harmonic, and fourth harmonic.
28. A method for manufacturing a semiconductor device comprising the steps of:
forming an insulating film over a substrate;
forming a semiconductor film on the insulating film;
crystallizing the semiconductor film by irradiation of harmonic of a YVO₄ laser;
patterning the crystallized semiconductor film to form a crystallized island-like semiconductor film; and
forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film,
wherein the insulating film comprises at least one material selected from the group consisting of silicon oxide, silicon oxynitride and silicon nitride.
29. A method according to claims 28, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.
30. A method according to claim 28, wherein the harmonic is one of second harmonic, third harmonic, and fourth harmonic.
31. A method for manufacturing a semiconductor device comprising the steps of:
forming a semiconductor film on an insulating surface;
providing a crystallization promoting material with the semiconductor film;
crystallizing the semiconductor film by irradiation of harmonic of a YVO₄ laser;
patterning the crystallized semiconductor film to form a crystallized island-like semiconductor film; and
forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film.
32. A method according to claims 31, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.

33. A method according to claim 31, wherein the harmonic is one of second harmonic, third harmonic, and fourth harmonic.
34. A method for manufacturing a semiconductor device comprising the steps of:
forming a semiconductor film on an insulating surface;
crystallizing the semiconductor film by irradiation of harmonic of a solid laser comprising Nd;
patterning the crystallized semiconductor film to form a crystallized island-like semiconductor film; and
forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film.
35. A method according to claims 34, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.
36. A method according to claim 34, wherein the harmonic is one of second harmonic, third harmonic, and fourth harmonic.
37. A method for manufacturing a semiconductor device comprising the steps of:
forming a semiconductor film on an insulating surface;
crystallizing the semiconductor film by irradiation of harmonic of a solid laser comprising Nd;
patterning the crystallized semiconductor film to form a crystallized island-like semiconductor film; and
forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film,
wherein the harmonic of the YVO_4 laser has a shape which has aspect ratio of 10 or more.
38. A method according to claims 37, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.
39. A method according to claim 37, wherein the harmonic is one of second harmonic, third harmonic, and fourth harmonic.
40. A method for manufacturing a semiconductor device comprising the steps of:
forming an insulating film over a substrate;
forming a semiconductor film over the insulating film;
crystallizing the semiconductor film by irradiation of harmonic of a solid laser comprising Nd;
patterning the crystallized semiconductor film to form a crystallized island-like semiconductor film; and
forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film,
wherein the insulating film comprises at least one material selected from the group consisting of silicon oxide, silicon nitride and silicon oxynitride.

41. A method according to claims 40, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.

42. A method according to claim 40, wherein the harmonic is one of second harmonic, third harmonic, and fourth harmonic.

43. A method for manufacturing a semiconductor device comprising the steps of:
 forming a semiconductor film on an insulating surface;
 providing a crystallization promoting material with the semiconductor film;
 crystallizing the semiconductor film by irradiation of harmonic of a solid laser comprising Nd;
 patterning the crystallized semiconductor film to form a crystallized island-like semiconductor film; and
 forming at least a channel region of a thin film transistor in the crystallized island-like semiconductor film.

44. A method according to claims 13, wherein the semiconductor film is an amorphous semiconductor film or a micro crystal semiconductor film.

45. A method according to claim 43, wherein the harmonic is one of second harmonic, third harmonic, and fourth harmonic. --